



The National Transportation Systems Center

The Role of Hydrogen in United States Rail Transit Future



U.S. Department of Transportation
Research and Innovative Technology Administration

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U.S. Volpe National Transportation Systems Center

- Vision: To Be the Leading U.S. Federal Center of Excellence for Innovative Transportation Systems Solutions
- Part of Research & Innovative Technology Administration
- Multimodal Research Center, est. 1970
- History of Successful Projects With U.S. Government Agencies and International Transportation Ministries
- Fee For Service

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Outline

- Volpe Center's Role in U.S. Hydrogen Transit Research
- U.S. Fuel Cell Rail Projects
- Volpe Center's Work on U.S. Electric Drive Strategic Plan

Volpe Center's Role in U.S. Hydrogen Transit Vehicle Research

- Volpe Center Has Supported U.S. Fuel Cell Bus Programs for Many Years
 - Led By U.S. Federal Transit Administration
 - Demonstration & Deployment, Testing & Evaluation, Outreach & Coordination
 - Then (1998): First PEM Fuel Cell Public Bus (Chicago)
 - Today: Eight buses currently in service
 - Future: Up to 12 More Planned by 2012
- Results
 - Transit Research Tends to Influence Larger Markets
 - e.g., Hybrid Electric Buses
- Other Activities Under U.S. Hydrogen Fuel Initiative⁶⁹

U.S. Hydrogen Transit Vehicle Research: New Opportunities

- History of Successful U.S. Fuel Cell Bus Research and Development
- Opportunity to Transfer Fuel Cell Bus Technology to Rail Systems
 - Rail Vehicles Can Use Many FC Bus Components
 - New Electrified Rail Systems are Expensive
 - Overhead Wires are Undesirable, Inefficient
 - U.S. Grid Power is Not Always Clean
- U.S. Electric Drive Strategic Plan Now in Development
- Volpe Center is Helping to Lead This Activity

Survey of U.S. Fuel Cell Rail Research Projects and Proposals

- Growing Interest
- Not Currently Funded by U.S. Department of Transportation
- Fuel Cell Switcher Locomotive
- Fuel Cell Subway Maintenance Locomotive
- Stationary Fuel Cells for Traction Power Backup



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Fuel Cell Switcher Locomotive

- U.S. Dept. of Defense and BNSF Railway
- Developed Quickly Using Hybrid Electric Switcher and Fuel Cell Bus Components
- Zero Emissions, Unlike Diesel Switchers
- Ideal for Stop-and-Go Cycles
- Fabrication Nearly Complete
- Demonstrations: Seaport and Army Base

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Fuel Cell Subway Maintenance Locomotive

- Transport Workers and Machines During Maintenance Operations (Rails Unpowered)
- Longer Range than Battery Powered Vehicles; No recharging
- Designed for Safe Operation in Tunnels
- Concept Phase

Stationary Fuel Cell Tractive Power Generation

- Connecticut Department of Transportation
- Stationary Fuel Cells Could Provide Alternate Traction Power Source for Existing Electrified Commuter Rail Service
- Power Transmission Congestion in Connecticut Poses Risk of Service Disruptions
- Study Complete; More Analysis Needed



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Hydrogen Streetcar Projects

- Several Cities Investigating Hydrogen Fuel Cell Powered Streetcars
- New Systems Where Overhead Wires Are Not Desirable
- Can Use Many Fuel Cell Bus Components
- Concept Phase



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U.S. Electric Drive Strategic Plan: Objectives

- Identify & Prioritize Research Activities That U.S. Federal Transit Administration Could Perform to Support Transit Operators Adopting Electric Drive Technology
- 20 Year Timeframe (2010-2030)
- 5 Year Action Plan (Beginning 2010)
- 5-year Research Plan in a 20 Year Strategic Context
- Bus and Rail Focus

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U.S. Electric Drive Strategic Plan: Outcomes

- Using Industry Input and Guidance, Develop a Viable Draft for the 2008 American Public Transportation Association Expo (October)
- Brief New U.S. Department of Transportation Secretary in 2009
- Provide Input for the Next Congressional Transportation Authorization

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Volpe Center's Work on U.S. Electric Drive Strategic Plan

- Working with U.S. Federal Transit Administration, U.S. Federal Rail Administration and WestStart/CALSTART
- Helped Establish Steering Group Comprised of U.S. Industry, Academic, and Equipment Supplier Representatives
- Facilitating Group Discussions and Capturing Results
- Performing Technical Analyses and Assessments
 - Technology Typology
 - Commercialization Plan
 - Survey of Complementary Research/Gap Analysis
- Writing and Editing Strategic Plan
- Public Outreach

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U.S. Electric Drive Strategic Plan: Rail Technology Pathways

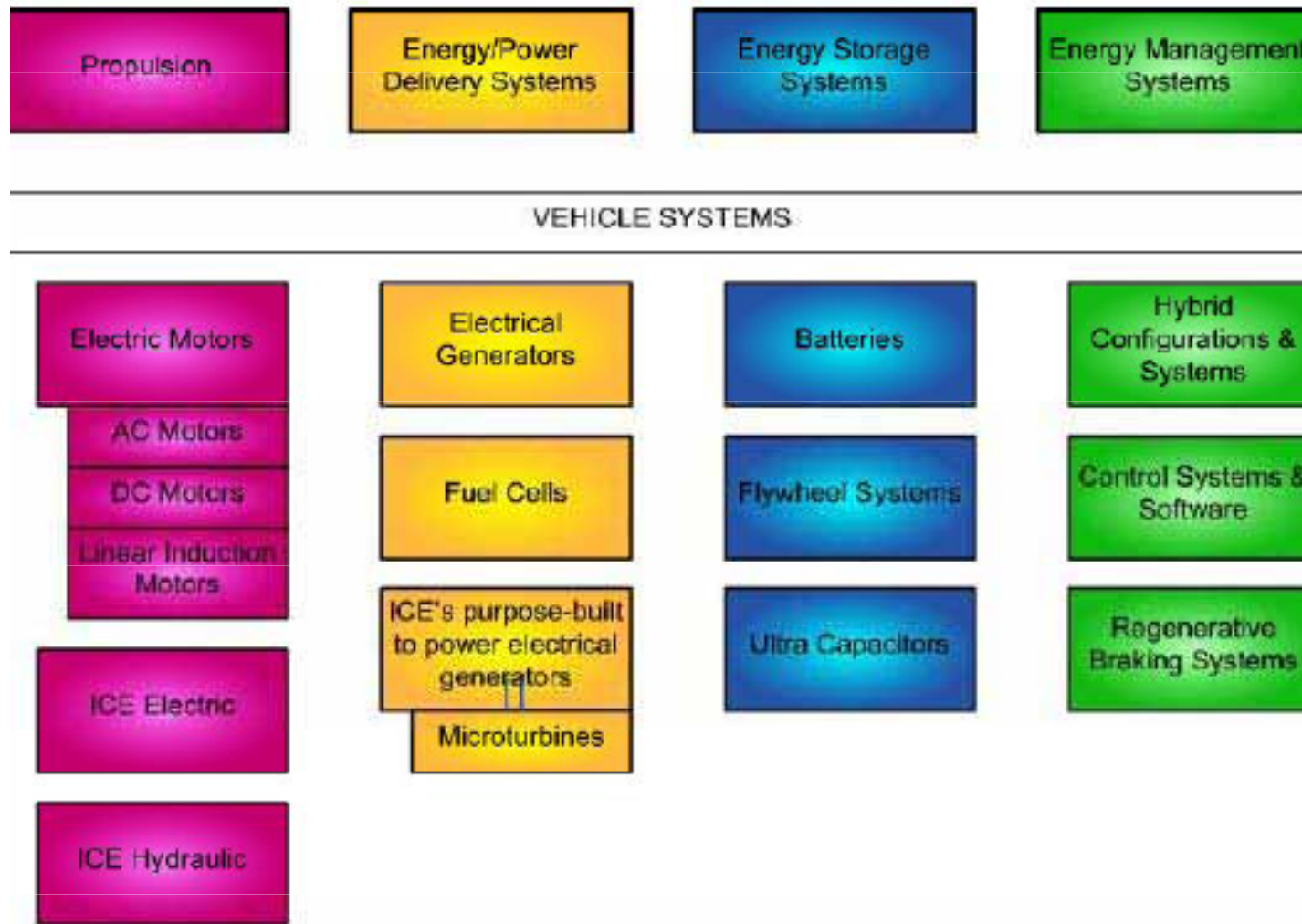
- On-Board Energy Storage
- Trackside Energy Storage
- Hybrid-Electric Vehicles
- Fuel Cell Vehicles



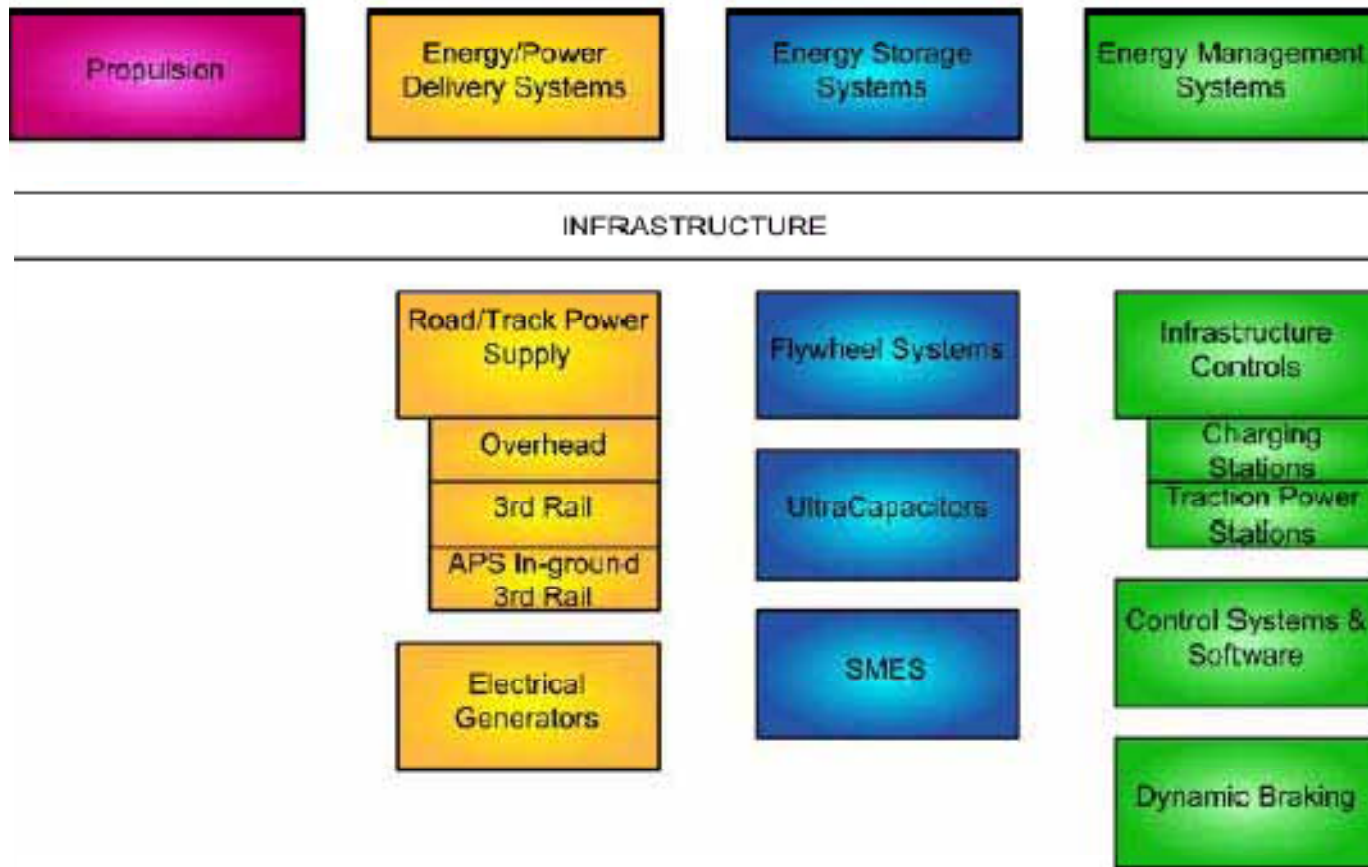
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Electric Drive Vehicle Typology



Electric Drive Vehicle Typology



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Volpe Center Capabilities: Alternative Fuels Research

- Hydrogen Transit Research Support
 - Design and Operation Guidelines
 - Safety Analyses
 - Program Management Support
- Broad Alternative Fuels Program
 - Alternative Fuels Roadmap
 - Coordination With Industry Groups
 - Engagement With Codes & Standards Developers

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